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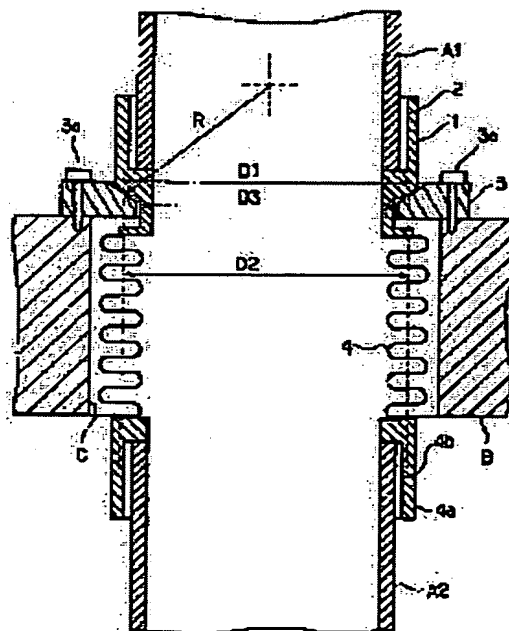
(54) CONNECTION SUPPORT STRUCTURE OF FILTER TUBE FOR DUST COLLECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a connection support structure of a filter tube for dust collector in which a filter tube is not floated with gas pressure at back-washing, and it is easily built in.

SOLUTION: In the connection support structure of a filter tube by which plural filter tubes A1, A2, are connected to a tube plate B having a through hole C through which the filter tubes penetrate and supported inside a can body being a main body of the dust collector, a bellows tube 4 is attached to the upper end part of the filter tube A2 an annular protective member 1 is attached to the lower end part of the filter tube A1, an annular support member 3 abutting the protective member 1 and supporting the

filter tube A2 is attached on a through hole part of the tube plate the contact part of the support member 1 with the support member 3 is made into a circular contact, and the diameter D1 of a contact circle is made to be approximately equal to the mean diameter D2 of the inner and outer diameters of the bellows tube.



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CLAIMS

[Claim(s)]

[Claim 1] In the connection supporting structure of filter tubing which connects and supports two or more filter tubing through the tube plate which has the breakthrough which filter tubing penetrates in the can which is a body of a dust collector An attachment component annular in the soffit section for bellows tubing in the upper bed section of filter tubing to anchoring and the penetration pore of a tube plate While attaching the annular supporter material which supports said filter tubing in contact with said attachment component Said attachment component and said supporter material by making the contact section with said supporter material of said attachment component into a spherical-surface configuration Circle line contact and nothing, And the connection supporting structure of filter tubing for dust collectors which is the connection supporting structure of filter tubing for dust collectors which connects each filter tubing with bellows tubing, and is characterized by the made thing on which the average diameter of the diameter of inside and outside of said bellows tubing, abbreviation, etc. spread the contact diameter of circle of said circle line contact.

[Claim 2] While dividing the attachment component of said filter tubing into the 1st attachment component in which it is attached by filter tubing, and the 2nd attachment component connected with bellows tubing of downward filter tubing and forming a concave in the peripheral face of this 2nd attachment component The connection supporting structure of filter tubing for dust collectors according to claim 1 which divided into the holddown member which fixes to a tube plate the retaining ring which fits said supporter material loosely into said concave, and this retaining ring, and made the contact section of said concave and said retaining ring with circle line contact.

[Claim 3] The connection supporting structure of filter tubing for dust collectors according to claim 1 or 2 said whose filter tubing is a product made from the ceramics.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the connection supporting structure of filter tubing for dust collectors, and relates to filter tubing for dust collectors which removes dust from elevated-temperature gas, and the connection supporting structure of filter tubing of especially the product made from the ceramics in detail.

[0002]

[Description of the Prior Art] The dust collector of the hot dusty gas which occurs in combustion processes, coal gasification plants, etc. which consist of an application-of-pressure fluid bed boiler currently developed recently as a dust collector from which the dust of elevated-temperature gas is removed, such as a power generating plant and a coal direct burner, is raised. In the dust collector of these elevated-temperature gas, ceramic filter tubing (thimble) which was excellent in elevated-temperature thermal resistance from a heat-resistant viewpoint is used, and the dust-removing technique using such ceramic filter tubing has been developed towards utilization (reference, such as JP,63-40567,B, JP,2-22689,B, and JP,3-24251,B).

[0003] By the way, the thing ceramic filter tubing is [thing] inferior to a mechanical strength and mechanical workability although thermal resistance, a filtration efficiency, etc. are excellent when using this ceramic filter tubing, There is a problem on the machine structure by the thermal property with the steel structure which constitutes the body of equipment, and the difference in coefficient of thermal expansion, Or since manufacture of large-sized filter tubing is difficult, about connection of filter tubing within a dust collector, and the supporting structure, the device of the conventional versatility is made from problems -- it is necessary to connect and use comparatively short filter tubing etc.. Moreover, filter tubing could not avoid that blinding, but a back wash activity is indispensable practically and, also for this reason, much more device has been made by the connection supporting structure of filter tubing. In addition, one example of playback of filter tubing and a back wash technique is explained by above-mentioned JP,2-22689,B in full detail.

[0004] Now, there are some which were indicated by JP,3-61076,B, JP,6-57286,B, or JP,7-101075,B as the connection supporting structure of filter tubing which solved such a technical problem.

Between each tube plate which has the breakthrough which two or more steps of things proposed here are prepared in the can which is a body of a dust collector, and filter tubing penetrates It is the connection supporting structure of filter tubing which connects and supports two or more filter tubing. An annular attachment component in the soffit section for bellows tubing at the upper bed section of filter tubing to anchoring and the penetration pore of a tube plate While attaching the annular supporter material which supports filter tubing in contact with an attachment component, the connection supporting structure of a spherical-surface configuration, nothing, and filter tubing for dust collectors that connects each filter tubing with bellows tubing is started in the contact section of an attachment component and supporter material.

[0005] To the both ends of filter tubing, by supporting an attachment component for steel bellows tubing and a steel attachment component by mounting beam supporter material to installation, a tube plate, or a tube plate through a proper buffer member, respectively, this technique supports filter tubing, and connects each filter tubing with dust tightness with bellows tubing, and solves the problem on thermal expansion of a ceramic, or equipment structure.

[0006] Permitting the inclination of the some of filter tubing, it makes the contact section of an attachment component and supporter material with a spherical-surface configuration in order to support filter tubing to dust tightness, and a thing given in JP,3-61076,B makes the mutual contact section with circle line contact. In addition, circle line contact forms the spherical surface in the contact section of one of the things in which the spherical surface was formed to the both sides of the contact section of an attachment component or supporter material, forms a taper side or a flat surface in the other party's contact section, and means the gestalt of the contact section in which both do line contact by the osculating circle here.

[0007] By the way, if it was in this manner of support, when back wash gas was made to act at the time of the back wash of filter tubing, the excessive force was applied depending on the pressure of back wash gas, and the problem that upper filter tubing came floating arose. For this reason, if it is in some which were indicated by JP,6-57286,B or JP,7-101075,B, it is rotating the attachment component of filter tubing, and the stop device which inhibits the relief to the upper part was established, and the relief of filter tubing is prevented. However, in order to secure the degree of freedom to some inclination, filter tubing cannot stop an attachment component thoroughly, but cannot but prepare the clearance between some. Therefore, it happens that filter tubing fluctuates between this clearance at the time of a back wash. Moreover, although carried out with this technique to the attachment component, i.e., the structure which a stop device commits by rotating filter tubing Although the rust and the resultant which were produced during operation of a dust collector in the clearance between stop devices adhere, and it is necessary to lose the degree of freedom of the inclination of filter tubing, or to rotate filter tubing in the case of removal of filter tubing, and to remove a stop device A revolution is not smoothly performed for various affixes, but the problem of doing breakage to filter tubing is also produced.

[0008]

[Problem(s) to be Solved by the Invention] this invention is made in view of the problem of the conventional technique like the above -- having -- dust -- the connection supporting structure of filter tubing of the dust collector which prevented the relief of filter tubing with the simple means is offered, maintaining tight spherical-surface contact good.

[0009]

[Means for Solving the Problem] In the connection supporting structure of filter tubing which this invention connects two or more filter tubing through the tube plate which has the breakthrough which filter tubing penetrates in the can which is a body of a dust collector, and is supported An attachment component annular in the soffit section for bellows tubing in the upper bed section of filter tubing to anchoring and the penetration pore of a tube plate While attaching the annular supporter material which supports said filter tubing in contact with said attachment component Said attachment component and said supporter material by making the contact section with said supporter material of said attachment component into a spherical-surface configuration Circle line contact and nothing, And it is the connection supporting structure of filter tubing for dust collectors which connects each filter tubing with bellows tubing, and is characterized by the made thing on which the average diameter of the diameter of inside and outside of said bellows tubing, abbreviation, etc. spread the contact diameter of circle of said circle line contact.

[0010] By this, even if back wash gas pressure or the differential pressure at the time of a direct flow acts, the relief of filter tubing can be prevented, various problems, such as generating of the dust leak which accompanies a filter tubing relief, and breakage of filter tubing, can be solved, and the activity of carrying out the revolution stop of the filter tubing also becomes unnecessary.

[0011] Moreover, while dividing the attachment component of said filter tubing into the 1st attachment component in which it is attached by filter tubing, and the 2nd attachment component connected with bellows tubing of downward filter tubing, and assembling it and forming a concave in the peripheral surface of this 2nd attachment component The retaining ring which fitted said supporter material loosely into said concave, and this retaining ring are divided into the holddown member fixed to a tube plate, and are assembled, and if it is in some which made the contact surface of said concave and said retaining ring with circle line contact, in addition to the above, the effectiveness that the assembly of the connection supporting structure becomes easy is done so.

[0012]

[Embodiment of the Invention] Hereafter, this invention is explained to a detail based on the desirable operation gestalt of this invention.

[0013] Drawing 1 is the sectional view which 1 operation gestalt of the connection supporting structure concerning this invention simplified. In drawing 1, 1 is the annular attachment component attached so that the soffit section of the upper filter tubing A1 might be supported through the proper buffer member 2. Annular spherical-surface 1a by which it has a core and the radius R went caudad on the center line of the filter tubing A1 is formed in the periphery which faces the supporter material of an attachment component 1. 3 is annular supporter material, and it is fixed to the upper part of the breakthrough C of a tube plate B by bolt 3a, and it has the contact surface of the shape of a taper which receives said spherical-surface 1a. 4 is bellows tubing and, as for the upper bed section of the bellows tubing 4, annular mounting member 4a for bellows tubing mounting is attached in the soffit section of a mounting eclipse and the bellows tubing 4 in the upper bed section of the lower filter tubing A2 through mounting eclipse and buffer member 4b at an attachment component 1. Thus, with the bellows tubing 4, while the up-and-down filter tubing A1 and A2 is connected with dust tightness, each filter tubing has the degree of freedom of some inclination in a circle line contact side.

[0014] Abbreviation etc. is spreading and carrying out the contact diameter of circle D1 of circle line contact, the outer diameter of the irregularity of the bellows tubing 4, and the pitch diameter D2 of a bore here. Both difference means 1% or less as spreading abbreviation etc. here preferably especially 3% or less. Thereby, even if back wash gas pressure or the differential pressure at the time of a direct flow acts, the force which pushes up the filter tubing A1 does not act. Although the force which pushes up the filter tubing A1 becomes $P \times \pi \times d_1 / 4 \times (D_{12} - D_{32})$ upward when this reason sets the back-washing pressure force P and the diameter of the innermost of the periphery of an attachment component 1 to D3 Since the force applied to the bellows tubing 4 on the other hand becomes $P \times \pi \times d_2 / 4 \times (D_{22} - D_{32})$, and abbreviation etc. spreads the magnitude of D1 and D2 and it is placing it upside down here, it is presumed that it is because it becomes and the force for which these force spreads abbreviation etc. and which offsets each other mutually and is applied to the filter tubing A1 serves as zero. Similarly, by [on which abbreviation etc. spreads D1 and D2] carrying out, when the differential pressure at the time of a direct flow acts, the force which pushes up the filter tubing A1 does not act.

[0015] Next, other operation gestalten are explained. Drawing 2 is the sectional view of other operation gestalten. In drawing 2, the thing of drawing 1, and a gestalt and what has the same function attach the same sign, and explanation is omitted. In drawing 2, 11 is the 1st attachment component, 12 is the 2nd attachment component, and the 1st attachment component 11 is together put so that it may fit into the 2nd attachment component 12, and it is concluded by dust tightness covering a peripheral surface with a bolt 13. The 1st attachment component 11 is attached in the filter tubing A1 so that the soffit section of the filter tubing A1 may be supported through the proper buffer member 2. Concave 12a is formed in the peripheral face of the 2nd attachment component 12, and the circle line contact side which went downward as well as the thing of the operation gestalt of drawing 1 is formed in the top face of concave 12a at it.

[0016] 31 is the retaining ring which fitted loosely into said concave 12a, forms a taper side in a top face, and forms the rib for immobilization in a peripheral face. It is the holddown member which fixes a retaining ring 31 to a tube plate B, and 32 consists of 1st holddown-member 32a and 2nd holddown-member 32b, pinches the rib of a retaining ring 31 between the 1st and 2nd holddown member 32a and 32b, with a bolt 33, it concludes the 1st and 2nd holddown member 32a and 32b, and fixes a retaining ring 31 to a tube plate B.

[0017] Even if it is in the thing of this operation gestalt, the effectiveness that D1 and D2 spread abbreviation etc. and that filter tubing is not pushed up even if back wash gas pressure acts as above-mentioned, since it is carried out is attained. Furthermore, if it is in the operation gestalt of drawing 2, the tube plate B is beforehand equipped with 2nd holddown-member 32b in the case of the assembly of the connection supporting structure. The filter tubing A2 united with annular mounting member 4a and buffer member 4b the 2nd attachment component 12 which fitted in the retaining ring 31, the bellows tubing 4, and for bellows tubing mounting is taken down from the upper part. It is made for the rib of a retaining ring 31 to be located in the rib slot of 2nd holddown-member 32b,

and subsequently, 1st holddown-member 32a is fixed to a tube plate B with a bolt 33 so that the rib of a retaining ring 31 may be pinched. Next, the mounting beam filter tubing A1 is taken down for the 1st attachment component 11, the 1st and 2nd attachment component 11 and 12 is concluded with a bolt 13, and a tube plate B is made to support the filter tubing A1.

[0018] Thus, since the retaining ring 31 of supporter material which divided the attachment component into the 1st and 2nd attachment component 11 and 12, and was divided into concave 12a of the 2nd attachment component 12 is fitted in loosely, a nest can be carried out independently, without making each up-and-down filter tubing into one, while mounting of filter tubing becomes easy, and nest workability can be improved greatly. Moreover, since the retaining ring 31 is fitted into 2nd holddown-member 32b, the diameter of a retaining ring 31 can be made small, the diameter of the breakthrough of a tube plate can be made small, and it is economically advantageous.

[0019] In addition, although what concludes the 1st and 2nd holddown member 32a and 32b with a bolt 33 was shown as a holddown member if it was in the operation gestalt shown in drawing 2, the large rib of a retaining ring can be taken depending on the case, and a rib can also be fixed to a direct tube plate with a bolt etc. In this case, a tube plate and a bolt mean the holddown member of a retaining ring.

[0020] The means of attachment of the concrete gestalt of each above-mentioned operation gestalt, each part material, bellows tubing, or each part material and filter tubing can adopt a proper gestalt and means of attachment not only according to what was illustrated but according to a case.

Moreover, although the fabrication approach of each part material, the loosely-fitting approach of a retaining ring, etc. omitted explanation of a detail, they can adopt a proper means if needed.

[0021] Moreover, although this invention demonstrates the operation effectiveness which applied and was excellent in filter tubing made from the ceramics, and desirable filter tubing made from the nature ceramics of cordierite, it is applicable to filter tubing of other construction material which has not only filter tubing of the ceramics but the same problem.

[0022]

[Effect of the Invention] In the connection supporting structure of filter tubing for dust collectors by this invention, various problems, such as generating of the dust leak which can prevent the relief of filter tubing even if back wash gas pressure or the differential pressure at the time of a direct flow acts on filter tubing, and accompanies a filter tubing relief with a simple means, and breakage of filter tubing, can be solved, and the effectiveness that assembly operation becomes easy is further done so.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view which 1 operation gestalt of this invention simplified.

[Drawing 2] It is the sectional view which other operation gestalten of this invention simplified.

[Description of Notations]

1 Attachment Component

2 Buffer Member

3 Supporter Material

4 Bellows Tubing

A1 Filter tubing (above)

A2 Filter tubing (below)

B Tube plate

11 1st Attachment Component

12 2nd Attachment Component

12a Concave

31 Retaining Ring

32 Holddown Member

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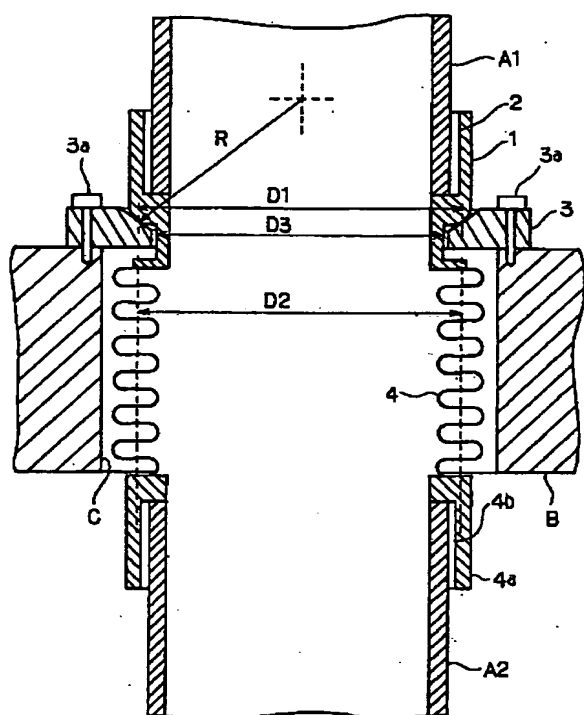
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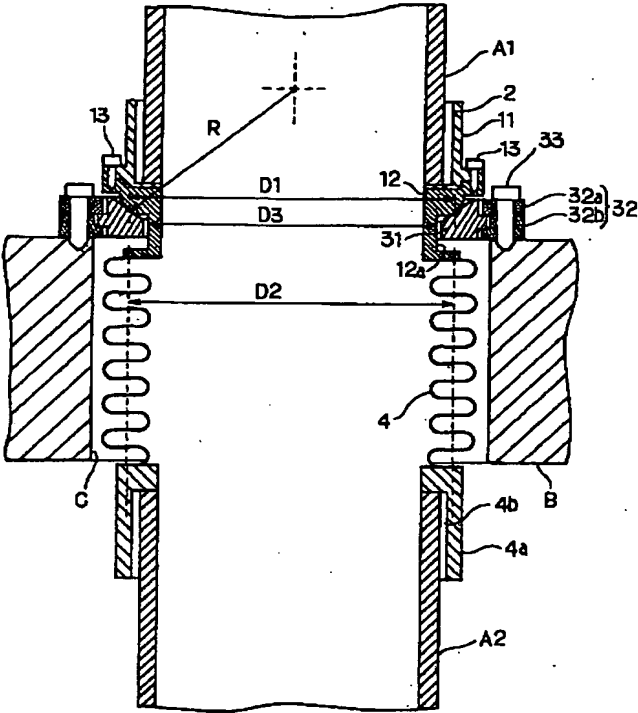
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DRAWINGS

[Drawing 1]



[Drawing 2]



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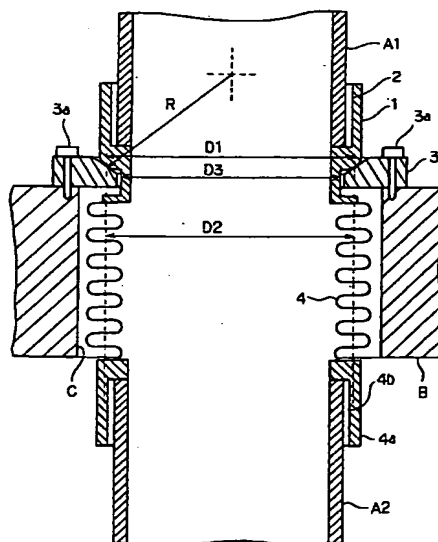
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(54) 【発明の名称】 除塵装置用のフィルタ管の連結支持構造

(57) 【要約】

【課題】 逆洗時のガス圧によるフィルタ管の浮き上がりがなく、組込みが容易な除塵装置のフィルタ管の連結支持構造。

【解決手段】 除塵装置の本体である缶体内に、フィルタ管Aが貫通する貫通孔Cを有する各管板Bの間に、複数のフィルタ管A1、A2を連結して支持するフィルタ管の連結支持構造において、フィルタ管A2の上端部にベローズ管4を、下端部に環状の保持部材1を取付け、管板の貫通孔部には、前記保持部材1に当接し前記フィルタ管A2を支持する環状の支持部材3を取り付けるとともに、前記保持部材1と前記支持部材3との接触部を円線接触となし、前記円線接触の接触円の直径D1を、前記ベローズ管の内外径の平均直径D2と略等しくなす。



【特許請求の範囲】

【請求項1】除塵装置の本体である缶体内に、フィルタ管が貫通する貫通孔を有する管板を通じて、複数のフィルタ管を連結して支持するフィルタ管の連結支持構造において、フィルタ管の上端部にペローズ管を、下端部に環状の保持部材を取付け、管板の貫通孔部には、前記保持部材に当接し前記フィルタ管を支持する環状の支持部材を取り付けるとともに、前記保持部材の前記支持部材との接触部を球面形状とすることにより前記保持部材と前記支持部材を円線接触となし、かつ、ペローズ管により各フィルタ管を連結する除塵装置用のフィルタ管の連結支持構造であって、前記円線接触の接触円の直径を、前記ペローズ管の内外径の平均直径と略等しくしたことを特徴とする除塵装置用のフィルタ管の連結支持構造。

【請求項2】前記フィルタ管の保持部材を、フィルタ管に取付けられる第1保持部材と下方のフィルタ管のペローズ管に連結される第2保持部材に分け、該第2保持部材の外周面に凹溝を形成するとともに、前記支持部材を、前記凹溝に遊嵌される支持リングと該支持リングを管板に固定する固定部材とに分け、前記凹溝と前記支持リングの接触部を円線接触となした請求項1記載の除塵装置用のフィルタ管の連結支持構造。

【請求項3】前記フィルタ管がセラミックス製である請求項1または2に記載の除塵装置用のフィルタ管の連結支持構造。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、除塵装置用のフィルタ管の連結支持構造に係り、詳しくは、高温ガスからダストを除去する除塵装置用のフィルタ管、特に、セラミックス製のフィルタ管の連結支持構造に関する。

【0002】

【従来の技術】高温ガスのダストを除去する除塵装置としては、近時開発されている加圧流動床ボイラからなる発電プラント、石炭直接燃焼装置などの燃焼プロセスや石炭ガス化プラントなどにおいて発生する高温の含塵ガスの除塵装置があげられる。これらの高温ガスの除塵装置においては、耐熱性の観点から高温耐熱性に優れたセラミックスフィルタ管(濾筒)が用いられ、このようなセラミックスフィルタ管を用いた除塵技術が実用化に向けて開発されて来ている(特公昭63-40567号公報、特公平2-22689号公報、特公平3-24251号公報等参照)。

【0003】ところで、このセラミックスフィルタ管を用いる場合、セラミックスフィルタ管は耐熱性、濾過性能等は優れているものの機械的強度、機械的加工性に劣ること、装置本体を構成する鋼構造との熱的性質、熱膨張率の差異による機械構造上の問題があること、あるいは、大型のフィルタ管の製造が困難のため、比較的短いフィルタ管を連結して用いる必要があること等の問題か

ら、除塵装置内での、フィルタ管の連結および支持構造については従来種々の工夫がなされている。また、フィルタ管はその目詰まりを避けることができず、実用上は逆洗作業が不可欠であって、このためにもフィルタ管の連結支持構造には一層の工夫がなされてきた。なお、フィルタ管の再生、逆洗技術の1例については前述の特公平2-22689号公報に詳述されている。

【0004】さて、このような課題を解決したフィルタ管の連結支持構造として、特公平3-61076号公報、特公平6-57286号公報、あるいは、特公平7-101075号公報に記載されたものがある。ここに提案されているものは、除塵装置の本体である缶体内に、複数段設けられ、フィルタ管が貫通する貫通孔を有する各管板の間に、複数のフィルタ管を連結して支持するフィルタ管の連結支持構造であって、フィルタ管の上端部にペローズ管を、下端部に環状の保持部材を取付け、管板の貫通孔部には、保持部材に当接しフィルタ管を支持する環状の支持部材を取り付けるとともに、保持部材と支持部材との接触部を球面形状となし、かつ、ペローズ管により各フィルタ管を連結する除塵装置用のフィルタ管の連結支持構造に係るものである。

【0005】この技術は、フィルタ管の両端部に、それぞれ、適宜の緩衝部材を介して鋼製のペローズ管と保持部材を取り付け、管板あるいは管板に取付けた支持部材で保持部材を支持することによりフィルタ管を支持し、また、ペローズ管によりダストタイトに各フィルタ管を連結して、セラミックの熱膨張上あるいは装置構造上の問題を解決したものである。

【0006】特公平3-61076号公報記載のものは、フィルタ管の若干の傾きを許容しつつ、ダストタイトにフィルタ管を支持するため保持部材と支持部材の接触部を球面形状となして、相互の接触部を円線接触となしたものである。なお、ここで、円線接触とは、保持部材あるいは支持部材の接触部の双方に球面を形成したもの、いずれか一方の接触部に球面を形成し、相手方の接触部にテーパ面あるいは平面を形成し、両者が接触円で線接触する接触部の形態をいう。

【0007】ところで、この支持方法にあつては、フィルタ管の逆洗時に逆洗ガスを作用させたとき、逆洗ガスの圧力によっては、過大な力がかかり、上方のフィルタ管が浮き上がるという問題が生じた。このため、特公平6-57286号公報、あるいは、特公平7-101075号公報に記載されたものにあつては、フィルタ管の保持部材を回転させることで、上方への浮き上がりを抑止する係止機構を設け、フィルタ管の浮き上がりを防止している。しかし、フィルタ管は若干の傾きに対する自由度を確保するために、保持部材を完全に係止することはできず、若干の隙間を設けざるを得ない。従つて、逆洗時にこの隙間の中でフィルタ管が上下することが起こる。また、この技術では、保持部材、すなわち、フィルタ管を回転させ

ることで係止機構が働く構造としているが、係止機構の隙間に、除塵装置の運転中に生じた錆や反応生成物が付着してフィルタ管の傾きの自由度が失われたり、フィルタ管の取外しの際は、フィルタ管を回転させ係止機構を外す必要があるが、各種付着物のため回転が円滑に行われず、フィルタ管に損傷を与えるという問題も生じる。

【0008】

【発明が解決しようとする課題】本発明は上記の如き従来技術の問題に鑑みなされたものであり、ダストタイトな球面接触を良好に維持しつつ、フィルタ管の浮き上がり
10 を簡易な手段で防止した除塵装置のフィルタ管の連結支持構造を提供するものである。

【0009】

【課題を解決するための手段】本発明は、除塵装置の本体である缶体内に、フィルタ管が貫通する貫通孔を有する管板を通じて、複数のフィルタ管を連結して支持する
20 フィルタ管の連結支持構造において、フィルタ管の上端部にベローズ管を、下端部に環状の保持部材を取付け、管板の貫通孔部には、前記保持部材に当接し前記フィルタ管を支持する環状の支持部材を取り付けるとともに、前記保持部材の前記支持部材との接触部を球面形状とすることにより前記保持部材と前記支持部材を円線接触となし、かつ、ベローズ管により各フィルタ管を連結する除塵装置用のフィルタ管の連結支持構造であって、前記円線接触の接触円の直径を、前記ベローズ管の内外径の平均直径と略等しくしたことを特徴とする。

【0010】これにより、逆洗ガス圧または正流時の差圧が作用してもフィルタ管の浮き上がりが防止でき、フィルタ管浮き上がりに付随するダストリークの発生、フィルタ管の破損等の種々の問題が解決でき、また、フィルタ管を回転係止するといった作業も不要となる。

【0011】また、前記フィルタ管の保持部材を、フィルタ管に取付けられる第1保持部材と下方のフィルタ管のベローズ管に連結される第2保持部材に分けて組み立て、かつ、該第2保持部材の周面に凹溝を形成するとともに、前記支持部材を、前記凹溝に遊嵌された支持リングと該支持リングを管板に固定する固定部材とに分けて組み立て、前記凹溝と前記支持リングの接触面を円線接触となしたものにあっては、上記に加え、連結支持構造の組立てが容易になるという効果を奏する。

【0012】

【発明の実施の形態】以下、本発明の好ましい実施形態に基づいて本発明を詳細に説明する。

【0013】図1は本発明に係る連結支持構造の一実施形態の簡略化した断面図である。図1において、1は、適宜の緩衝部材2を介して上のフィルタ管A1の下端部を支持するごとく取付けられた環状の保持部材である。保持部材1の支持部材に面する外周には、フィルタ管A1の中心線上に中心を有し半径R、下方に向かった環状の球面1aが形成されている。3は、環状の支持部材
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であり、管板Bの貫通孔Cの上部にボルト3aにより固定され、前記球面1aを受けるテーパ状の接触面を有する。4はベローズ管であり、ベローズ管4の上端部は保持部材1に取付けられ、ベローズ管4の下端部には、ベローズ管取付用の環状取付部材4aが取付けられ、緩衝部材4bを介して下のフィルタ管A2の上端部に取付けられる。このようにベローズ管4により、上下のフィルタ管A1とA2がダストタイトに連結されるとともに各フィルタ管は円線接触面において若干の傾きの自由度を有する。

【0014】ここに、円線接触の接触円の直径D1とベローズ管4の凹凸の外径と内径の平均径D2を略等しくしている。ここで略等しくとは、好ましくは両者の差が3%以下、特に好ましくは1%以下を意味する。これにより、逆洗ガス圧または正流時の差圧が作用してもフィルタ管A1を押し上げる力は作用しない。この理由は、逆洗圧力P、保持部材1の外周の最内径をD3としたとき、フィルタ管A1を押し上げる力は、上向きに、 $P \times \pi \times 1 / 4 \times (D1^2 - D3^2)$ となるが、一方ベローズ管4にかかる力は、下向きに、 $P \times \pi \times 1 / 4 \times (D2^2 - D3^2)$ となり、ここで、D1とD2の大きさを略等しくしているため、これらの力は略等しくなり互いに相殺してフィルタ管A1に掛かる力はゼロとなるからであると推定される。同様に、D1とD2を略等しくすることにより、正流時の差圧が作用する場合もフィルタ管A1を押し上げる力は作用しない。

【0015】次に他の実施形態について説明する。図2は、他の実施形態の断面図である。図2において、図1のものと形態、機能が同一のものは同じ符号を付し説明は省略する。図2において、11は第1保持部材、12は第2保持部材であり、第1保持部材11は、第2保持部材12に嵌合するごとく組み合わせられ、ボルト13により周面にわたってダストタイトに締結される。第1保持部材11は、適宜の緩衝部材2を介してフィルタ管A1の下端部を支持するごとくフィルタ管A1に取付けられる。第2保持部材12の外周面には、凹溝12aが形成され、凹溝12aの上面には、図1の実施形態のものと同じく下に向かった円線接触面が形成されている。

【0016】31は、前記凹溝12aに遊嵌された支持リングであり、上面にテーパ面を形成し、外周面には固定用のリブを形成している。32は、支持リング31を管板Bに固定する固定部材であり、第1固定部材32aと第2固定部材32bとからなり、第1、第2固定部材32a、32bの間に支持リング31のリブを挟持し、ボルト33によって第1、第2固定部材32a、32bを締結して支持リング31を管板Bに固定する。

【0017】この実施形態のものにあっても、D1とD2は略等しくされているので前述のとおり逆洗ガス圧が作用してもフィルタ管が押し上げられないという効果が達成される。さらに、図2の実施形態にあつては、連結

支持構造の組立ての際、予め第2固定部材32bを管板Bに装着しておき、支持リング31を嵌挿した第2保持部材12、ベローズ管4、ベローズ管取付用の環状取付部材4aおよび緩衝部材4bと一体化されたフィルタ管A2を上方から降ろし、支持リング31のリップを、第2固定部材32bのリップ溝に位置せしめ、次いで、支持リング31のリップを挟持するように第1固定部材32aをボルト33で管板Bに固定する。次に第1保持部材11を取付けたフィルタ管A1を降ろし、第1、第2保持部材11、12をボルト13によって締結し、フィルタ管A1を管板Bに支持させる。

【0018】このように、保持部材を第1、第2保持部材11、12に分割し、第2保持部材12の凹溝12aに、分割した支持部材の支持リング31を遊嵌しているので、フィルタ管の取付作業が容易になるとともに上下の各フィルタ管を一体とすることなく別々に組込みでき、組込み作業性を大きく改善できる。また、支持リング31を第2固定部材32bに嵌合しているので支持リング31の直径を小さくでき、管板の貫通孔の直径を小さくでき、経済的にも有利である。

【0019】なお、第2図に示した実施形態にあつては、固定部材として、第1、第2固定部材32a、32bをボルト33で締結するものを示したが、場合によっては支持リングのリップを大きく取り、リップを直接管板にボルト等で固定することもできる。この場合、管板とボルトが支持リングの固定部材を意味する。

【0020】上述の各実施形態の具体的形態、各部材とベローズ管、あるいは各部材とフィルタ管との取付方法は図示したものに限らず、場合に応じて適宜の形態、取付方法を採用できる。また、各部材の製作方法、支持リングの遊嵌方法などは詳細の説明を省いたが必要に応じ適宜の手段を採用できる。

【0021】また、本発明は、セラミックス製のフィルタ管、好ましくはコーディエライト質セラミックス製のフィルタ管に適用して優れた作用効果を発揮するものの、セラミックスのフィルタ管に限らず、同様の問題を有する他の材質のフィルタ管に適用できるものである。

【0022】

【発明の効果】本発明による除塵装置用のフィルタ管の連結支持構造では、簡易な手段で、フィルタ管に逆洗ガス圧または正流時の差圧が作用してもフィルタ管の浮き上がりが防止でき、また、フィルタ管浮き上がりに付随するダストリークの発生、フィルタ管の破損等の種々の問題が解決でき、さらには、組立作業が容易になるという効果を奏する。

【図面の簡単な説明】

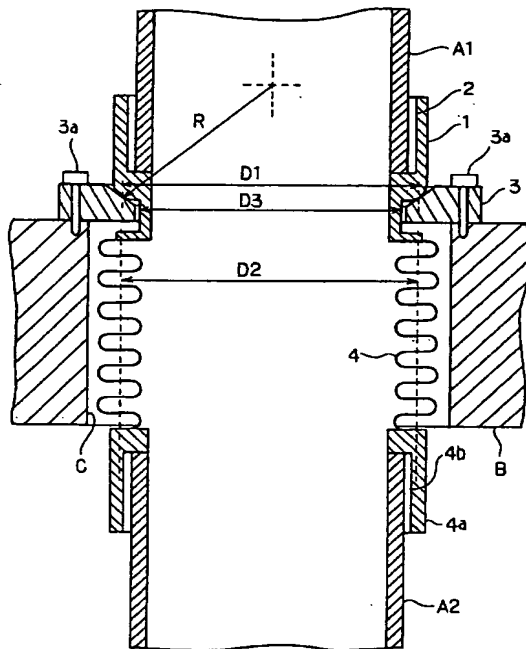
【図1】本発明の一実施形態の簡略化した断面図である。

【図2】本発明の他の実施形態の簡略化した断面図である。

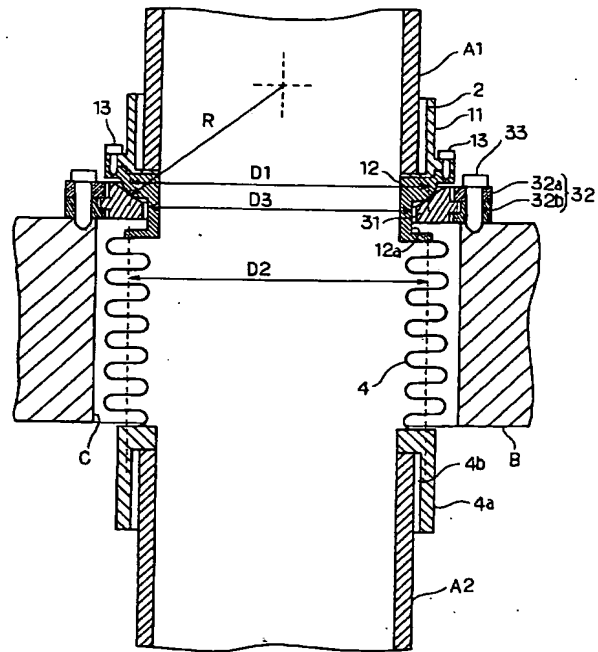
【符号の説明】

1	保持部材
2	緩衝部材
3	支持部材
4	ベローズ管
A1	フィルタ管(上)
A2	フィルタ管(下)
B	管板
11	第1保持部材
12	第2保持部材
12a	凹溝
31	支持リング
32	固定部材

【図1】



【図2】



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